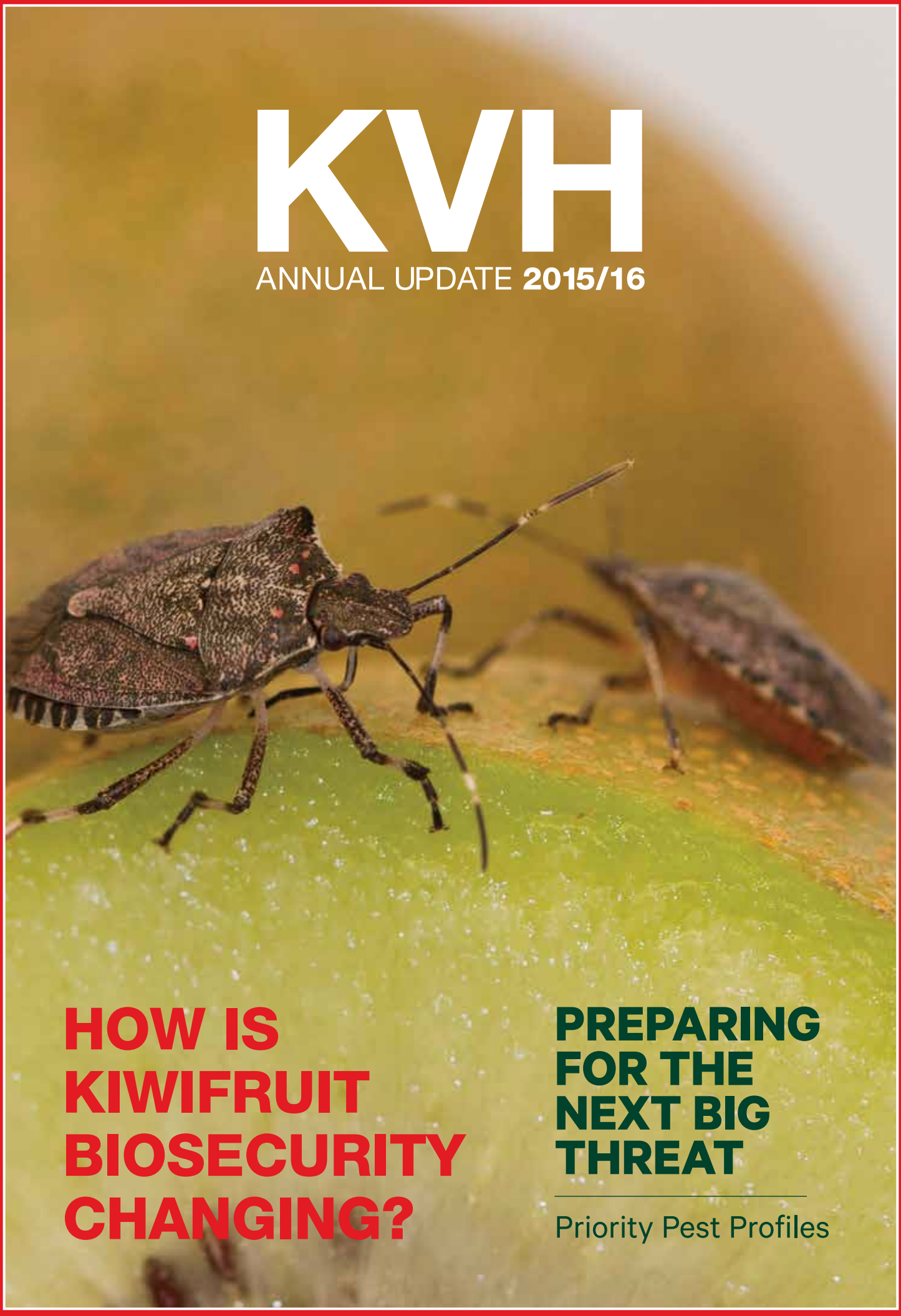
KVH

ANNUAL UPDATE **2015/16**



HOW IS KIWIFRUIT BIOSECURITY CHANGING?

PREPARING FOR THE NEXT BIG THREAT

Priority Pest Profiles

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CHAIRMAN'S FOREWORD

This year as I stand down as Chairman of the KVH Board, I reflect back on my last three years in the role and how far KVH and the industry has come on its recovery pathway from Psa.

I strongly feel that KVH is in a very good position to meet future Psa and other biosecurity challenges. While we are limited in our ability to influence wider biosecurity risks that are out of our control, I am certain we are doing all we can to achieve the best possible outcomes for the kiwifruit industry.

A key contributor to achieving this success is working closely with the Ministry for Primary Industries, (MPI) and this is supported through our Government Industry Agreements (GIA) partnership. While MPI is New Zealand's lead agency for the country's biosecurity system, it's essential for the kiwifruit industry to have significant input into biosecurity matters that could impact us.

Biosecurity has become a huge focus for all New Zealand primary industries. As global trade and incoming passenger numbers increase, so too does New Zealand's biosecurity challenges. We recognise MPI has responded to this rise in risk through many proactive initiatives. However, we must also be proactive ourselves and continually work to understand and be prepared for the pests and diseases that threaten our industry.

Brown Marmorated Stink Bug (BMSB) is a pest among many horticultural sectors and one we don't want establishing in New Zealand. As part of an industry biosecurity research group, KVH has commissioned trials in the USA to determine just how serious a risk BMSB is to kiwifruit. What we do know is that early detection of this pest is essential, so we continue to raise the profile of it amongst our industry.

On 9 May KVH signed the Operational Agreement (OA) for fruit flies on behalf of the kiwifruit industry. The signing was a significant milestone to further improve biosecurity readiness and response activities for fruit flies and the first such agreement under the GIA partnership. On this note, I'm pleased to add the Minister recently agreed for KVH to represent New Zealand Kiwiberry Growers (NZKBG) under GIA and we look forward to growing this relationship.

The OA sets out the requirements for readiness and response activities for fruit flies; enables joint decision-making; and clarifies cost-sharing arrangements between government and affected industries. Under the OA, KVH and other parties will agree a work plan to improve readiness and response, including how we can detect fruit flies earlier and also reducing costs without reducing effectiveness.

Keeping proactive can also mean challenging MPI and at times, engaging in healthy debate to achieve an acceptable solution for all. A good example of this was the discovery of White Peach Scale (WPS) on imported Italian kiwifruit earlier this year in local supermarkets. As one of our most unwanted pests, concerns raised by KVH resulted in additional treatments to all consignments of imported Italian kiwifruit.

The Kiwifruit Plant Certification Scheme (KPCS) is another KVH-led initiative to reduce the spread of Psa and other diseases through the movement of nursery plants. On 1 October 2016 this Scheme becomes fully implemented – meaning all suppliers of kiwifruit rootstock right across the industry are taking steps to manage this risk. Among other benefits of the KPCS, growers can be confident they are purchasing healthy plants of known pest and disease status.

This year also marked three years in May since the National Psa-V Pest Management Plan (NPMP) was first implemented and KVH has recently undertaken a non-statutory internal review of the Plan. The review was to firstly challenge the need for the NPMP, and then focusing on ensuring the plan remains effective and identifying improvements to align with ongoing Psa control challenges.

The review confirmed for the KVH Board the need to continue with a comprehensive plan to combat the ongoing impacts of Psa, particularly since the bacteria is rapidly evolving and starting to show signs of resistance to control products Streptomycin and copper. Essentially, resistant Psa is like a new form of bacteria, so effective control measures must be kept in place to reduce its spread and impacts. To remove the NPMP at this stage would be too risky.

On a final note, I'd like to thank those who have contributed to the success of KVH including Chief Executive Barry O'Neil, staff and my colleagues on the KVH Board. There have been some recent changes to the Board, including the departure of Directors Craig Thompson, Peter Silcock, Jarrad Mair and Board Secretary, Mike Chapman. We have also welcomed Alister Hawkey as a Director and Richard Proctor as the Board Secretary. The 2016 KVH AGM will also determine a new independent director, three new grower directors and subsequently, a new Chairman.

I wish them the very best and will watch KVH's next few years with great interest.

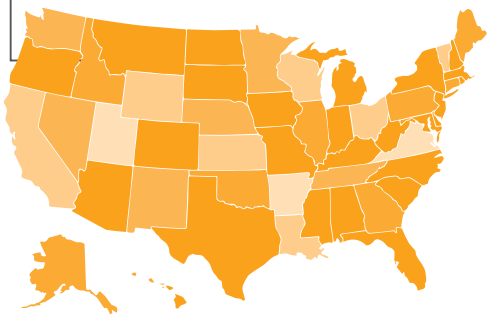
Peter Ombler - Chairman

DID YOU KNOW...

42 STATES in the USA

have Brown Marmorated Stink Bug (BMSB) present

since being **accidentally imported** in 1996.



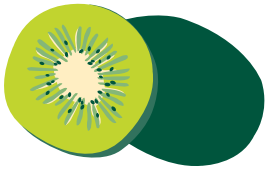
$1.12 MILLION
eradication cost
per fruit fly *found in Grey Lynn*

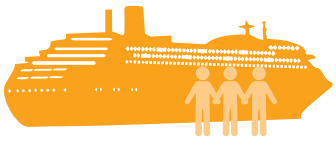
26 THOUSAND BMSBs found
*in **one** house in the USA over winter!*

$430 MILLION
Annual cost to New Zealand kiwifruit industry
if fruit flies were to establish in the Bay of Plenty

9.3 THOUSAND
wild kiwifruit vines controlled across 102 properties in the BOP
over the last THREE years

400 YEARS
Copper has been used in horticulture and agriculture
*to protect crops from **pests and diseases***





200,000
CRUISE SHIP PASSENGERS
entered NZ in 2015

5.6M PEOPLE
enter NZ every year

*Prior to the BMSB US growers **WERE** applying:*

2 SPRAYS annually

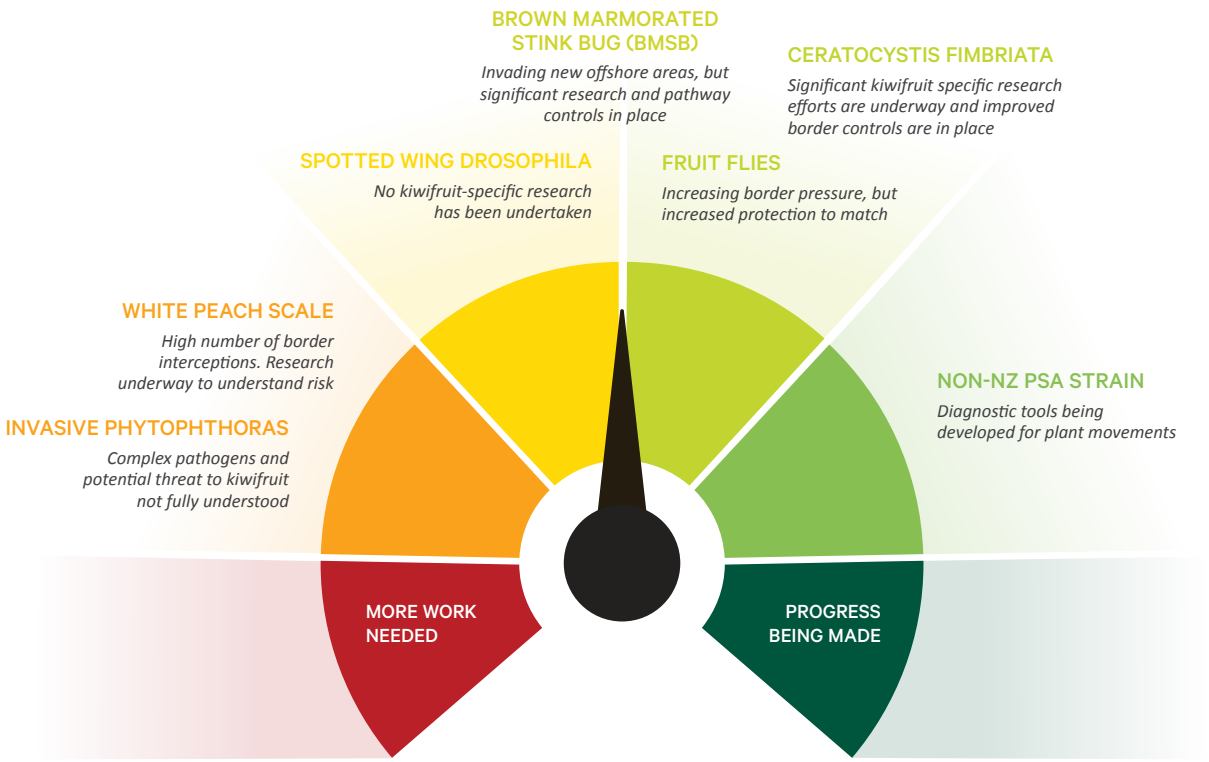
***NOW** some are applying up to:*

2 SPRAYS weekly
to combat the BMSB

60,000+
SURVEILLANCE TRAPS
*in place throughout NZ to detect **new pests!***

144 ORGANISATIONS
***including KVH** are ready to mobilise in the event of a biosecurity response .*

HOW IS BIOSECURITY RISK CHANGING?



HOW IS KVH INFLUENCING BIOSECURITY RISK?

Some of our activities to reduce risk include:

UNDERSTANDING OUR EMERGING RISKS

Significant efforts to increase our understanding of kiwifruit biosecurity threats have been undertaken. This includes, but is not limited to, kiwifruit's 'Most Unwanted' pest and disease list. However, there is likely to be a large number of unknown biosecurity threats, either not yet observed or reported.

EARLY DETECTION FOR BEST CHANCE OF ERADICATION

Development of a sector Operational Agreement for kiwifruit specific pests is underway, along with the development of diagnostic tools for earlier detection of new pathogens. There is an increasing awareness across the industry to report any unusual pests or disease symptoms.

READY TO RESPOND

Industry response group, KiwiNet, has been established and deployed into a fruit fly response. KVH has also taken part in an all of government response simulation for BMSB. An Operational Agreement for fruit fly in now in place which sets out how Government Industry Agreement (GIA) partners will work together during a fruit fly response.

ON ORCHARD BIOSECURITY

The Kiwifruit Plant Certification Scheme (KPCS) has been implemented to reduce risk through the movement of nursery plant material. However, many other practices such as basic orchard and tool hygiene are declining amongst growers, as most perceive the risk of Psa-V as reducing, and are not taking into account that these practices reduce the risks of other biosecurity threats. KVH intends to do more in this area over the coming year to reduce the impact of a future biosecurity incursion should one occur. KVH is looking to improve budwood/ pollen cleaning processes.

FRUIT FLIES

$15.7M - the cost of the 2015 Queensland Fruit Fly response in Auckland.

Response statistics:
14 fruit flies found, **1000 disposal bins** deployed cleared more than **99,000 times, 530 tonnes** of produce waste collected and disposed of, **4500 traps** deployed across Auckland.

$430m – cost to the industry if a breeding population of fruit flies were found in Te Puke.

14 fruit flies detected at the New Zealand border during the 2015/16 summer.

4148 undeclared risk items seized from air passengers during 2015-16 summer, of which 60% is fruit fly host material.

Fruit flies are the kiwifruit industry's number 1 enemy!

New Zealand is classified as 'fruit fly free' and we want to keep it that way! Queensland Fruit Fly, Oriental Fruit Fly and Mediterranean Fruit Fly are the most serious threat to the kiwifruit industry.

The consequence of fruit flies establishing in New Zealand would be catastrophic to our horticultural industries and hobby gardeners. Impacts would be two-fold: fruit production and market access restrictions—with the latter being the most destructive for New Zealand's economy.

Queensland fruit fly in particular is the greatest concern as few countries have this pest and therefore market access restrictions are the greatest, but also the risk of entry is climbing with increased passenger numbers and a fruit fly population in Australia that is expanding. Australia's Plant Biosecurity Cooperative Research Centre last year estimated the cost of fruit fly in Australia to be A$300 million a year in control and due to lost markets. Fortunately, there have been significant efforts in New Zealand over the past year to mitigate this risk.

AUCKLAND FRUIT FLY RESPONSE

In February 2015 a single, male Queensland Fruit Fly was discovered in a trap in the residential Auckland suburb of Grey Lynn. The discovery of a small breeding population a few days later kicked off the largest fruit fly eradication response programme in New Zealand for almost 20 years – the last one being a Mediterranean fruit fly breeding population found in Auckland in 1996.

While the last fruit fly in the response was found in March 2015 (14 fruit flies and 152 larvae were found in total), eradication efforts had to continue until New Zealand was once again fruit-fly free to the Ministry for Primary Industries (MPI) and offshore markets.

MPI confirmed the population was successfully eradicated in December 2015 after 10 months of intense response activity that had a significant impact on MPI and industry resources and the local community.

KVH ROLE UNDER GOVERNMENT INDUSTRY AGREEMENTS (GIA)

The Grey Lynn fruit fly response was the first large-scale biosecurity response where KVH was involved in the decision-making and operational process from day one; and this was thanks to KVH's partnership with government under Government Industry Agreements (GIA).

Working closely with MPI, AsureQuality (AQ), Horticulture NZ and other GIA signatory Pipfruit NZ throughout the response forged good working relationships and ensured the best decisions were being made to address industry's priorities and biggest risks.

The experience highlighted that managing New Zealand's biosecurity system, both readiness and response, requires the collective efforts of both government and industry partners.

A response such as this one is always a massive learning curve for all involved and lessons have been learnt to identify what we can do better in the future for both readiness and response.

Photo: Controlled Area signage during the Auckland Fruit Fly response.

Photo: KVH Compliance Officer, John Mather and MPI Director General, Martyn Dunne during the Fruit Fly response in Auckland.

BROWN MARMORATED STINK BUG

Above: KVH and Zespri commissioned research is underway in California to assess BMSB impacts on kiwifruit.

BMSB is ranked number two on KVH's list of **Most Unwanted** organisms. This is possibly one of the greatest biosecurity threats currently facing New Zealand!

12,348 the number of stinkbugs a US resident removed from their home in just 45 days • **38 interception events** at the NZ border over the summer of 2015/16, each interception had between 1 and 15 individual BMSB's.

It is difficult to keep out: As a hitchhiker it could enter New Zealand on many different pathways including containers and vehicles, but also mail items from Asia, USA and Europe.

It eats everything: BMSB is not fussy and will eat over 300 types of plants. This likely includes kiwifruit but we are doing more research to verify this.

We can't trap it: Unlike fruit fly there are no effective traps for small populations of BMSB. So if it does get here we don't have an effective surveillance system in place to detect it.
It's hard to kill. Eradication is extremely difficult and would only be successful if we detected it early. If it established here, growers may have to increase their spray program and this may cause issues with some markets.

It's not just a problem for horticulture – It is also a severe nuisance pest as adults enter vehicles, homes and factories in large numbers in autumn months, looking for places to shelter over winter. In parts of the US infestations are so bad that some people are moving cities.

WHAT ARE WE DOING TO MITIGATE RISK?

BMSB is a major focus for KVH, MPI and all horticultural industries and significant efforts are being put into keeping this pest out, but also preparing should it arrive. KVH represents the kiwifruit industry as part of MPI's "BMSB network" which includes other GIA signatories and industry organisations. **KVH's involvement in these activities includes the following:**

DEVELOPING A RESPONSE FRAMEWORK UNDER GIA

Late last year KVH took part in an all-of-Government response exercise on BMSB to assess strategic risks associated with response options. We are also working with government to progress cost shares under GIA and believe with this pest, Government should pay 100%.

RESEARCH EFFORTS TO MITIGATE RISK AND IMPACT OF BMSB

KVH is part of a research group that overviews the R&D focus and priorities. Three priorities are developing effective traps and pheromones, ACVM approval of effective control sprays and assessing biological control options. A parasitoid wasp is Asia is showing promise and if safe, we want to be ready to import it should BMSB establish in NZ.

COMMUNICATIONS TO RAISE PUBLIC AWARENESS AND EARLY DETECTION

KVH co-funds a BMSB public awareness campaign with MPI and other GIA partners to increase early detection through passive surveillance. This campaign been a success, resulting in a significant increase in suspect BMSB finds, particularly in the Bay of Plenty.

We are also strengthening awareness amongst the kiwifruit industry, associated industries such as the Port of Tauranga and the freight and logistics sector and also with members of public. Advocating for tighter measures to reduce the likelihood of entry

WHAT CAN YOU DO

Early detection is critical. Keep an eye out for BMSB and encourage your friends to do the same. If you think you have found one, CATCH IT AND CALL MPI ON 0800 80 99 66.

"This weekend I vacuumed up more than 8,000 stink bugs in my attic, to add to the 4,000 I've removed from my living space. I have now destroyed 12,348 stinkbugs in my home in 45 days."

Photo: US homeowners plight.

CERATOCYSTIS FIMBRIATA

Ceratocystis fimbriata - pathogen causing economic impacts to many crops around the world with Kiwifruit identified as one of the 8 most susceptible hosts.

3 days from symptom observation to vine death in kiwifruit
10-30% vine mortality per year in affected Brazilian kiwifruit orchards

Ceratocystis fimbriata is a fungal pathogen that is causing significant damage to kiwifruit orchards in Brazil, with some growers reporting 50% vine loss over the past five years.

C. fimbriata has a world-wide distribution, including New Zealand where it was first identified in 1907 causing black rot on kumara. However, recent research by KVH has shown that this New Zealand strain does not affect kiwifruit. Impacts to kiwifruit vines in Brazil are severe with vine death occurring extremely rapidly once symptoms are seen; and KVH has identified kiwifruit is highly susceptible to multiple strains. Kiwifruit, previously considered one of the most profitable crops in the region, may no longer be economically viable in this part of Brazil. Chances of eradication if it established in New Zealand are slim unless detected early. To date, no treatments have been effective - with fungicides and phosphoric acids being trialed by many growers.

WHAT ARE WE DOING TO MITIGATE THE RISK?

KVH and Zespri have funded a number of research projects to better understand this pathogen and reduce the likelihood and consequence of impacts to the New Zealand industry.

These include:

- Information provided by KVH resulted in MPI strengthening Import Standards. This information was raised following a Literature review to better understand the risk and impact of *C. fimbriata* on NZ kiwifruit – completed by Professor Tom Harrington, a world expert in this field.
- Staff from KVH, Zespri and Plant and Food Research have made several visits to Brazil to assess the impact of this pathogen first hand
- Pathogenicity screening of the kumara *C. fimbriata* strain on NZ kiwifruit to determine if we already have a strain of concern in New Zealand. Results show we don't and therefore need to focus on keeping other pathogenic strains out.
- Pathogenicity screening of different isolates of *C. fimbriata* on different kiwifruit cultivars to better understand the risk, and whether some varieties show increased tolerance (underway).
- Sequencing of the pathogen and primer development to provide a tool for use at the border, and for detection in the field should we be faced with an incursion.

This research is advancing our knowledge and making us more prepared should we be faced with an incursion, but it is also helping us keep the pathogen out. Professor Harrington's report provided a level of detail that was not previously available and when this was given to MPI's Emerging Risk System it resulted in emergency measures being applied to import pathways to provide greater protection from this emerging risk.

WHAT CAN YOU DO?

Movement of infected plant material, and contaminated orchard equipment is considered the highest risk of spreading *C. fimbriata.* Therefore, good on-orchard hygiene and sourcing cleanest possible plant material are the best preventative measures. The introduction of the strain into Brazilian orchards was likely through imported nursery plants from Chile and was spread through the industry before they knew it existed.

Notify KVH
of any unusual
plant symptoms
0800 665 825

EUROPE

Brown Marmorated Stink Bug has spread to eight European countries, creating new entry pathways to be managed to prevent entry into New Zealand.

CHINA

Industry visits indicate the presence of a number of kiwifruit pathogens in China. New Zealand scientists have been collaborating with China to better understand these.

ITALY

1000 hectares of kiwifruit vines decline in Verona, Italy. KVH contributing to research to understand cause.

AUSTRALIA

Fruit fly populations are increasing in Australia, including two outbreaks of Mediterranean Fruit Fly in Adelaide in 2016.

WHAT'S HAPPENING AROUND THE WORLD?

KEEPING PACE WITH CHANGE

Biosecurity risk is constantly changing over time as new organisms are discovered, expand their host range or invade new geographic areas. New Zealand's biosecurity system must constantly evolve to keep pace.

This page illustrates some of the key events over the past 12 months that influence risk for the New Zealand kiwifruit industry.

KOREA

Brown Marmorated Stink Bug reported in Korean kiwifruit orchards but impacts unknown. 'Summer canker' causes symptoms similar to Psa but occurs in the warmer summer months.

USA

New treatments for imported vehicles and machinery from the USA introduced to reduce the risk of BMSB entering NZ.

FLORIDA

Oriental fruit fly outbreak in Florida. Over 160 flies found resulting in a 220 km2 quarantine area just before harvest in a state where horticulture is worth US$1.6. Aerial spraying was used as a final resort to eradicate.

BRAZIL

Ceratocystis fimbriata causing significant impacts to kiwifruit in Brazil. Also causing significant impacts to other host plants such as the native Ohi'a trees in Hawaii, which are closely related to the New Zealand Pohutakawa.

NEW ZEALAND

Passenger levy established in 2016 increases border biosecurity resources.

90 new frontline staff and 24 new detector dog teams employed at NZ's border.

X-ray machines at cruise ships reduce risk of fruit fly host material entering NZ.

Biosecurity Excellence at Port of Tauranga initiative launched in 2016.

Operational Agreement for fruit flies signed in 2016.

CHILE

Psa-V continues to spread to new regions and significantly impact the Chilean kiwifruit industry.

Chile also experienced two separate Mediterranean fruit fly incursions and Spotted Wing Drosophila was reported for the first time in 2015 when breeding populations were found in the wild near the port of Valpariso.

KIWINET

Most residents were always happy to help and we met some truly wonderful people in the area. The locals and the people working in the response were doing all they could to help eradicate this fruit fly."

Jan Purdie from Apata

Photo: KVH Biosecurity Analyst and KiwiNet member, Matt Dyck, establishing fruit fly traps during the Auckland fruit fly response.

So many people from all over New Zealand were deployed with only a few hours' notice. Their work ethic, energy and compassion were very inspiring. The operation is an enormous logistical task and all New Zealanders should be very proud of what MPI and industry have accomplished so far and are continuing to do so."

Lisa Ferguson from Trevelyan's

KiwiNet is the team of people selected from right across the kiwifruit industry who champion biosecurity readiness and coordinate the deployment of kiwifruit industry resources into biosecurity responses.

The group was established as part of the industry's commitment to readiness and response planning under Government Industry Agreements (GIA). It is also part of the National Biosecurity Capability Network (NBCN), which is New Zealand's field capability team deployed during all biosecurity responses.

The discovery of Queensland fruit fly in Grey Lynn in February 2015 provided an opportunity to deploy KiwiNet. Within two days of the initial notification, people from all over the kiwifruit industry were heading to Auckland to help MPI and AsureQuality in the field, mainly with trapping, monitoring, fruit collection and surveillance work.

During the height of the response more than 50 people from the kiwifruit industry worked on the ground in Auckland.

The level of support and engagement for KiwiNet from across the industry during this worrying time was excellent.

KVH meets with KiwiNet personnel twice a year to ensure members are engaged and updated with any potential biosecurity issues.

KIWINET PROFILES

Jan Purdie from Apata

Jan was deployed through KiwiNet and spent five days in the response operations in Grey Lynn. Within hours of receiving a call requesting help with the fruit fly response, Jan arrived in Auckland for her first briefing. Jan spent the next five days as part of the surveillance team. This meant going from door to door in the controlled area talking to residents and asking them a series of questions.

Jan said local residents were very receptive and showed a lot of concern about fruit fly being discovered in their area. "Most residents were always happy to help and we met some truly wonderful people in the area. The locals and the people working in the response were doing all they could to help eradicate this fruit fly."

Lisa Ferguson, Trevelyan's Pack and Cool

Lisa was contacted through KiwiNet to assist with the response operations and spent seven days in the field as a fruit fly trapper. Trapping is a huge task. Around 335 traps in Zone A were checked daily; and more than 730 traps in Zone B were checked every three days. Around 20 trappers are deployed, each monitoring 60-70 traps per day. Traps are checked, serviced and scanned using an electronic device, which then transmits accurate data back to HQ for analysis.

Lisa was inspired by the comradery and team culture during the response. "So many people from all over New Zealand were deployed with only a few hours' notice. Their work ethic, energy and compassion were very inspiring. The operation is an enormous logistical task and all New Zealanders should be very proud of what MPI and industry have accomplished so far and are continuing to do so."

MANAGING OUR INTERNAL PATHWAYS

Update on the Kiwifruit Plant Certification Scheme

Parts of the (kiwifruit) industry appear to mistakenly assume that more stringent movement and hygiene controls are only needed during a response to bacteria like Psa-V. But this ignores the risk that a new pest or disease affecting the industry might arrive in New Zealand and spread for some time before it is discovered."

Sapere Review 2014, Lessons learned from the response to Psa-V.

- **Nursery stock can transport pests and pathogens over long distances, including exotic organisms that may be present but not yet reported**
- **A survey of 732 European nurseries found that over 90% had at least one species of Phytophthora pathogen present.**
- **"Parts of the (kiwifruit) industry appear to mistakenly assume that more stringent movement and hygiene controls are only needed during a response to bacteria like Psa-V. But this ignores the risk that a new pest or disease affecting the industry might arrive in New Zealand and spread for some time before it is discovered."** – Sapere Review 2014, Lessons learned from the response to Psa-V

Over the last two years, KVH has introduced the Kiwifruit Plant Certification Scheme (KPCS) to reduce the risk of pests and diseases being spread through the movement of nursery plants and ensure that if we are ever faced with another serious biosecurity incursion again, we will be better prepared. In October 2016, this scheme becomes fully implemented ensuring that all suppliers of kiwifruit rootstock right across the industry are taking steps to manage biosecurity risks.

The introduction of this scheme offers the industry the following benefits;

- Minimises the risk of spreading any new pests or diseases that might not yet be discovered;
- Minimises the spread of pests and diseases already in New Zealand, including Psa-V, between kiwifruit growing regions;
- Increases the prospects of successful vine establishment by starting with healthy plants of known pest and disease status;
- Allows efficient movement of cultivars throughout New Zealand by providing a clear and consistent framework; and
- Recognises nurseries operating to professional standards.

From 1 October 2016, only KPCS-certified kiwifruit plants may be bought, sold or moved between properties. However, growers may still produce plants on their own property for use on that property. They may also produce up to 1000 plants for movement between their own properties within the same Psa-V region. KVH movement controls will still apply. Further details on the options available for sourcing plants beyond October 2016 are available on the KVH website **www.kvh.org.nz/kpcs.**

There are already a number of nurseries producing KPCS certified plants and more have indicated that they will join the scheme in the near future. These nurseries are already increasing supply to meet future demand. However, to avoid getting left with unsold plants at the end of the season, these nurseries are increasingly growing-to-order. Therefore, growers are reminded to order plants well in advance (at least one year) to ensure they don't miss out!

PURSUING BIOSECURITY EXCELLENCE AT PORT OF TAURANGA

Photo: The Brown Marmorated Stink Bug features during September, the start of BMSB high-risk season.

Staff working in and around the Port of Tauranga can play a big part in keeping unwanted pests and diseases out of New Zealand.

That's why KVH, together with the Port of Tauranga Limited (POTL) and the Ministry for Primary Industries (MPI), with support from other stakeholders including NZ Customs Service, Bay of Plenty Regional Council, Fonterra, Forest Owners Association and NZ Avocados, established a working group with the aim of pursuing 'biosecurity excellence at Port of Tauranga'.

The group explores opportunities to innovate and strengthen the current biosecurity activities at the POTL and progresses initiatives to raise awareness amongst staff and reduce risk.

Initiatives include port user education through visual biosecurity signage and collateral, increased detector dog use for incoming cruise ship passengers, regular biosecurity updates and a biosecurity module in the POTL worker induction process.

KVH chairs the working group and coordinates the partnership. The initiative has been developed specifically for POTL, given its location and the serious consequences a biosecurity event associated at this Port would have on the kiwifruit industry. However, the intention is to develop a model that over time could be applied wider as biosecurity excellence is needed across all New Zealand ports.

OFFICIAL LAUNCH

In late February, the Minister for Primary Industries, Nathan Guy, officially launched the initiative which was attended by around 50 representatives from industry, government and the port community.

2016 PEST CALENDAR

Hundreds of '2016 Pest Calendars' were distributed throughout common areas at the POTL, transitional facilities and the Bay of Plenty freight and logistics sector. Featuring 12 unwanted pests that could potentially enter through the Port of Tauranga, the calendar illustrates to staff to know what to look for, where to look for them and what to do should they suspect something unusual.

This initiative is already paying off with staff reporting what they thought were Brown Marmorated Stink Bugs the day following calendar distribution. Thankfully they weren't BMSB, but their reporting demonstrates small initiatives can make a real difference.

Photo: Minister for Primary Industries, Nathan Guy with MPI dog-hander Niina Edgar and Ayla.

Photo: Industry, government and port communities unveil new biosecurity signage at the launch event.

PSA SITUATION UPDATE

Psa-V has been identified in 15 of the 16 growing regions and almost 90% of kiwifruit growing hectares are on an orchard affected by the disease. The South Island remains the only kiwifruit growing region where the disease has not been identified.

In September 2015 the first Whangarei orchard was identified with Psa-V. A combination of the swift removal of infected vines by the affected grower, along with the proactive Psa management plans already in place by Whangarei growers, means the disease has not been identified on any other orchards in the Whangarei region to date.

The more susceptible variety, Hort16A, has been removed from almost every region, with just a very small amount remaining. Removal of this variety and the associated inoculum risk, has greatly reduced the overall long-term Psa-V risk.

The Gold3 cultivar is showing significantly more tolerance to Psa-V than Hort16A and performs well in most growing environments with an active Psa-V management plan in place. However, in challenged, colder sites, significant die back and cankering can still occur.

The development of flower infection attributed to Psa-V on Hayward orchards has been a significant concern for many growers. However, a pre-flowering trunk girdle has proven to be a successful tool to assist in the control of bud-rot. This practice has been widely picked up by growers and highlights a successful R&D outcome to control Psa-V.

RESISTANCE TO PSA CONTROL PRODUCTS

Photo: Kiwifruit bay in ongoing Psa resistance monitoring programme.

Photo: Lab samples in ongoing Psa resistance testing programme.

The potential for Psa bacteria to develop resistance to control products has been a concern for KVH and the industry since Psa was discovered in NZ.

As few products are known to have efficacy against Psa, the loss of one or more of these due to resistance would make the disease much more difficult to manage.

For this reason, a monitoring and testing programme has been in place since 2011 which tests Psa bacteria for any signs of product resistance.

Through this programme, streptomycin-resistant Psa was first identified in April 2015 and has since been detected on a small number of orchards across three growing regions.

Psa bacteria with resistance to copper was identified in mid-2015 and recent rounds of monitoring and testing have shown an increase in the number of samples with low levels of copper resistance.

While the level of resistance identified is still well below the concentration of copper in a spray tank when applied at recommended rates, the development is concerning.

KVH has been actively working with the affected growers to reduce both the impact of Psa on their orchard; and the potential to spread the resistant bacteria to other orchards.

KVH has also developed a 'Best Practice Guide' for growers to help limit resistance developing on their orchards and is working with the New Zealand Committee on Pesticide Resistance on a resistance management strategy.

It's essential all kiwifruit growers incorporate best-practice strategies into their orchard management plans to reduce the risk of resistance developing; and to minimise the build-up and spread of resistant populations when present.

Best practice advice to avoid resistance developing or spreading:

- Monitor orchards regularly for symptoms of Psa
- Remove and dispose of diseased material from the orchard
- Ensure strict orchard hygiene measures are in place
- Maintain a year-round comprehensive Psa-V protective spray programme
- Use a combination of and/or alternate effective products from the KVH Recommended Product List
- Always use label rates
- Ensure good spray coverage is achieved
- Restrict plant movement from orchards where resistance is suspected/known
- Contact KVH if resistance or tolerance is suspected

In addition to the resistance monitoring programme, Otago University, Massey University and Plant and Food Research are undertaking studies looking at the genome sequence of Psa and how the bacteria are evolving on orchards. All these researchers have identified the presence of additional genes that they believe are associated with copper and streptomycin resistance in Psa. A PCR based test has been developed to detect the two genetic types of streptomycin resistance. However, copper resistance can be due to a larger number of genes, meaning it is difficult to develop a rapid test for it.

Through the R&D and product testing programme Zespri and KVH continue to test for alternative sustainable control approaches for management of Psa-V.

NATIONAL PSA-V PEST MANAGEMENT PLAN – INTERNAL REVIEW

May 2016 marked three years since the National Psa-V Pest Management Plan (NPMP) was put in place.

While the term of such a plan is 10 years, whereby a review is required by the Minister for Biosecurity, the KVH Board opted for more frequent reviews to capture lessons and make sure the NPMP delivers maximum value to growers and the industry.

In 2014 they commissioned "Sapere" to undertake an independent review of lessons learned from the Psa-V Response, which considered the first year of NPMP implementation.

This year they commissioned an internal, non-statutory review on the NPMP. This was carried out by KVH management with valued input from growers, postharvest, marketers and the Ministry for Primary Industries (MPI).

The review first considered if the NPMP was still needed. It then focused on ensuring the NPMP remains effective going forward and identifying improvements to align with ongoing Psa control challenges.

The KVH Board confirmed the need to continue with a comprehensive plan to combat the ongoing impacts of Psa - a decision not taken lightly. The key factor for the Board's decision was recognition that Psa is rapidly evolving, starting to show signs of product resistance and more virulent strains are a real possibility. The Board also recognised the NPMP continues to deliver other advantages.

These include:

- the ability to manage risk associated with abandoned orchards, wild kiwifruit, and unmanaged orchards;
- the ability to provide independent assessment and science-based advice on risk profile and management practices for new and existing cultivars; and
- underpinning safe movements of plant material both within NZ and to offshore markets, given some international quarantine arrangements are linked to the NPMP.

Key areas for improvement and associated recommendations are:

1. **Psa-V Risk Management Plans – growers and postharvest/processors**
   Recommendation is to apply the lessons learned from the Sapere Report; and broaden the scope of Psa-V Risk Management Plans to become Biosecurity Management Plans
2. **Establishment of new exclusion regions**
   Recommendation is to provide for new 'exclusion' regions, with the aim of protecting new growing regions and sites outside current grower regions through movement controls of high-risk items to these sites.
3. **Boundaries of existing regions**
   Recommendation is to retain existing regional boundaries, which are advantageous in terms of managing more virulent or resistant/tolerant forms of Psa-V and the ability to limit spread of new biosecurity threats that may be present but not detected. Ensuring appropriate 'ease of movement' (e.g., plant material) for growers will be achieved by adjusting movement controls over time.
4. **Mandatory monitoring**
   Recommendation is to further rationalise monitoring requirements. Mandatory monitoring is now limited to non-detected orchards, and KVH will continue some independent monitoring to clarify the situation in containment regions with limited infection, and for exclusion regions.
5. **KVH movement controls and protocols**
   Recommendation is to review movement controls and protocols to ensure these are aligned and consistent with our current understanding of Psa 'risk'. This has been completed, but recognises pollen and budwood still need to be better aligned with other aspects of the programme and continued research focus is needed to improve risk management for these.
6. **Abandoned/unmanaged orchards and wild kiwifruit**
   Recommendation is to continue with KVH's existing approach to unmanaged and abandoned orchards and wild kiwifruit (refer to page 17).
7. **Research & Development**
   Recommendation is to continue to strengthen the R&D programme in the four major programmes areas (refer to page 18).
8. **Psa-V Biosecurity Levy**
   Recommendation is to reduce funding to 28 cents per kilogram of kiwifruit (1 cent per tray equivalent) for gold kiwifruit, aligning this with the current rate for green kiwifruit (this change will be considered by members at the KVH AGM).

The next review of the NPMP is scheduled for May 2019.

Photo: KVH will convene a group of leading growers, postharvest and technical specialists in August 2016, to start designing new biosecurity practices that are pragmatic and will serve long term needs of the industry (including meeting NPMP requirements).

Diagram: The KVH Board has approved the first new exclusion region – the 'Far North' exclusion region.

WILD KIWIFRUIT AND ABANDONED ORCHARDS

Photo: Several wild kiwifruit vines grow up a pine tree near Katikati in the Bay of Plenty (Jon Sullivan photo).

ABANDONED ORCHARDS

Since January 2015, KVH has worked with the owners of 20 abandoned kiwifruit orchards, resulting in the removal of 18 orchards (29 canopy hectares) and returning the other two orchards (three canopy hectares) to a managed state.

These heavily overgrown orchards have the ability to harbour Psa and other risk organisms and infect nearby managed orchards.

Working together with Councils, KVH regional committees and landowners, we are able to achieve excellent progress in removing abandoned orchards and significantly reduce the biosecurity risk these orchards pose.

The majority of removal costs were funded by landowners or lessees with contributions made by Regional and District Councils and KVH.

The last years' work brings the total number of abandoned orchards recorded since January 2012 to 118. Of these 103 have now been removed, three orchards are well advanced with the removal process and the remaining 12 orchards have been returned to a managed state. The orchards were located in all kiwifruit growing regions of New Zealand.

WILD KIWIFRUIT

Over the last year, Bay of Plenty contractors controlled 4,988 wild kiwifruit vines on 47 properties. Sporadic infestations in the Gisborne and Nelson-Tasman Districts were also controlled by local contractors.

KVH works closely with regional councils to ensure that any wild kiwifruit vines within their regions are destroyed. Wild kiwifruit has established in scrubland or forest within close proximity of producing orchards, or where reject fruit has been fed to stock such as cattle or deer.

Wild kiwifruit establishes through birds feeding on unpicked fruit and distributing the seed. Regional Councils support the wild kiwifruit control programme to protect the biodiversity value of natural areas and safeguard the kiwifruit production element of their regional economies, as wild vines may also harbour pests which could then spread to commercial orchards.

KVH continues to work in partnership with landowners and the Bay of Plenty Regional Council through a collaboratively funded programme. Council agreed via their Long Term Plan review to continue their support of the wild kiwifruit control programme. Three two-person teams are now controlling wild kiwifruit in the Bay of Plenty – one of these is an abseiling team controlling wild kiwifruit on the sides of deep gullies in especially Te Puke and the lower Kaimais.

Photo: An abandoned kiwifruit orchard is removed in South Auckland.

DELIVERING A WORLD-CLASS PSA INNOVATION PROGRAMME

Over the last few years, the joint KVH/Zespri Psa research programme and Steering Group has focussed on gaining as much knowledge about the plant pathogen interaction as quickly as possible; and to provide growers with tools and management approaches to minimise its impacts.

This has often meant our on-orchard Psa research projects have been conducted as succinct experiments isolating a specific vine growth phase, and have relied on the presence of natural Psa inoculum sources and appropriate weather conditions to drive inoculum pressure.

Obviously these relatively short-term research projects can be hit and miss and with the variability in New Zealand weather patterns from year to year and within a season, a single season's results may not reflect longer term disease patterns. Focussing forward, and to get a greater understanding of the industry needs from the Psa research programme, gap analysis and brainstorming sessions were held within the industry over the past 12 months.

Photo: Pre-flowering trunk girdle - a successful R&D outcome to control Psa.

Key themes that repeatedly came up during these meetings were:

- How do we control, manage or supress the internal or systemic population of Psa within vines? Is this the role of elicitors or other treatment/management approaches?
- How do we ensure continued G3 orchard productivity in a Psa environment? What are the best management strategies to employ? What level of infection (leader canker) is a tipping point for vine productivity, survival and when do we replace leaders/vines?
- With green varieties, the concern was around bud rot and can we better predict its occurrence? What does the disease cycle involve and what are its drivers that we can interfere with and control?
- Leaf spotting isn't the only issue. How can we identify the infection events that lead to secondary symptom development for better control strategies?
- How does Psa interact with other microbes in the environment, on the plant? Can these microbes somehow offer a means of controlling Psa?

To address these key questions, a redesign of the Psa research strategy was implemented culminating in the development of four central research programmes. Each programme will run over multiple years to take into account the perennial nature of the kiwifruit production cycle including year on year differences in seasonal weather influences and the fluctuations that these can have on Psa disease pressure from season to season.

THE FOUR PROGRAMMES ARE:

1. Systemic Psa infection and management of the endophytic population

This programme focuses on Psa populations living inside kiwifruit plants, often without any signs of infection. Understanding where Psa is, why it can stay as a harmless endophyte and what triggers the change to a pathogenic state, will lead to the development of management methods that will prevent these endophytic populations from becoming pathogenic and also stop the transfer of Psa via plant tissues.

2. Managing Gold3 in a Psa environment

This programme aims to develop a better understanding of bacterial canker (Psa) in Gold3 kiwifruit in order to optimise management strategies for long term orchard productivity and profitability. Within this programme, methods for quantifying viable populations Pseudomonas syringae pv actinidiae (biovar 3) in Gold3 kiwifruit vines will be further developed and optimised. These techniques will facilitate studies to evaluate the effects of different orchard management practices on pathogen establishment and on subsequent disease development. Studies will be conducted on monitor vines in selected orchards over 3-4 years and will inform the development of best practise for management of Psa in Gold3.

3. Understanding Psa population dynamics for improved control

One of the largest knowledge gaps identified for Pseudomonas syringae pv. actinidiae (Psa) is around the events and factors leading to the development of 'secondary' infections (die-back, cankers etc.) and bud rot (in 'green' varieties). This is a critical focus of this programme and will provide robust disease cycle information (when and where are vines becoming infected), leading to better informed disease management decisions.

The second part of this programme aims to extend this to determine regional influences on the life cycle of Psa, potentially leading to control strategies that are tailored for each region.

4. Understanding the Kiwifruit Microbiome (micro-organism interactions)

The lack of understanding of what makes up the kiwifruit microbiome has been raised as a gap in our understanding, and potentially a gap in controlling Psa and maintaining plant health. Psa survives on the leaf in a relatively protected biofilm, which will include other micro-organisms.

The question arises of what are the other micro-organisms in the biofilm and how does Psa interact with them to ensure its survival in the biofilm? If we could control the micro-organisms involved in the biofilm signalling, which Psa responds to, could we develop better control techniques? Does the biofilm population change in response to Psa? When we apply bactericides, what are we doing to any beneficial or non-pathogenic micro-organisms? Do we need to replace them to ensure kiwifruit vine health?

The objectives of this programme are to investigate the microbiome of the leaf, stem, buds, flowers and roots, and gain an understanding of how we can control Psa through controlling the biofilm. Within each programme will be individual projects aligned to the programme's overall objective and will have in place results focused milestones that will allow for programme updates and recommendations for growers as results come to hand.

BIOSECURITY INNOVATION PROGRAMME

*KVH and Zespri are investing over **$400k** per year into a Biosecurity Research Portfolio with a goal of reducing the risk and impact of biosecurity incursions to the kiwifruit industry.*

Investment in science to better understand biosecurity threats to our industry, and to develop tools to mitigate their impact should they arrive, is a big priority for the kiwifruit industry.

KVH and Zespri are investing over $400k per year into a Biosecurity Research Portfolio with a goal of reducing the risk and impact of biosecurity incursions to the kiwifruit industry. The portfolio is funded by the KVH biosecurity levy, with matching contributions by Zespri and is managed by Zespri Innovation.

Overseeing the research portfolio is the Kiwifruit Biosecurity Steering Group who identify research needs and priorities, and ensure that projects will deliver the desired outcome of mitigating future biosecurity impacts. The Steering Group also use their individual networks to contribute and discuss reports of new biosecurity threats, or changes in the distribution, host range or impacts of known threats that could elevate the risk profile of these threats to the kiwifruit industry.

The Steering Group considers research needs for these emerging risks and the appropriate venture to undertake such projects; whether this is inclusion in the Biosecurity Research Portfolio or where multiple sectors may benefit from research outcomes recommend inclusion in broader portfolios (i.e. such as B3 or Crown Research Institutes).

Biosecurity research objectives include;

- Develop a greater understanding of the biosecurity threats to the kiwifruit industry;
- Develop tools to reduce the likelihood of establishment and impact of these biosecurity threats, which includes tools for diagnostics, surveillance, eradication and management; and
- Pathway analysis to understand where gaps may occur in the biosecurity system and take a collaborative approach with the Ministry for Primary Industries to address these.

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Christine Reed	Manager, Risk Analysis	Ministry for Primary Industries
Brad Siebert	Biosecurity Manager	Avocados NZ
Rebecca Ganley	Research Leader - Pathology	Scion

KVH has also been providing input into other research ventures that may impact or benefit our industry, such as Better Border Biosecurity (B3) and the Government's National Science Challenge (NSC). The NSC are scientist-led programs designed to tackle New Zealand's biggest science-based challenges. There are eleven such Challenges and one of these, "New Zealand's Biological Heritage", includes focusing on ensuring the NZ science system directs its effort and investment in the right areas to innovate in biosecurity. Our involvement includes contribution of Barry O'Neil as a member of the governance group overseeing the challenge, and that of Andrew Harrison as co-Chair of an End-User Advisory Panel.

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